ABSTRACT OF THE DISCLOSURE

Liquid chemical compositions are disclosed for anaerobic biodegradation, detoxification, and transformation of toxic organic and inorganic compounds in a contaminated geologic media under reducing conditions, including, but not limited to, denitrifying, manganese-reducing, iron-reducing and sulfate-reducing conditions. One such liquid chemical composition includes sodium nitrate in the range of one-fifth (0.2) to four (4) pounds per gallon of the chemical composition; sodium hexametaphosphate or other biologically hydrolyzable ring or linear polyphosphate in the range of one twentieth (0.05) to five (5) pounds per gallon of the chemical composition; a surfactant in the range of 0.01% to 10% by volume of the chemical composition; and a diluent in the form of water.

A bioremediation apparatus is disclosed for anaerobic biodegradation, detoxification, and transformation of toxic organic and inorganic compounds in a contaminated geologic media. The bioremediation apparatus includes a first set of one or more storage tanks containing a chemical composition for anaerobic biodegradation of toxic compounds in contaminated geologic media; a plurality of quick disconnect valve couplings connected to the first set of storage tanks; at least one logic controller having a logic controller programmer component for opening and closing an automatic valve means connected to the first set of storage tanks to supply the chemical composition to the contaminated geologic media; and a screened well connected to the first set of storage

tanks for supplying the chemical composition to the contaminated geologic media.

A method is disclosed for anaerobic biodegradation, detoxification, and transformation of toxic organic and inorganic compounds in a contaminated geologic media comprising the steps of pressurizing one or more storage tanks containing a chemical composition using an inert carrier gas; connecting a plurality of quick disconnect valve couplings to one or more pressurized storage tanks; connecting a well to an automatic ball valve for supplying the chemical composition and the inert carrier gas through the well to the contaminated geologic media; and opening and closing the automatic ball valve to dispense the chemical composition and the inert carrier gas under pressure through the well to the contaminated geologic media. Methods are also disclosed for alternating the cycles of redox potential and the predominant microbial respiration pathway within the contaminated geological media.